

Subject (*)      Concurrency and Parallelism      Grado Excellation Intomatica      SiteSprogramma	Subject (*)  Concurrency and Parallelism  Code  402021    Study programm  Grace and parallelism  Code  400108    Subject (*)  Grace and parallelism  Type  Code    Cycle  Pariod  Yaar  Type  Code    Graduate  SponionCollidant-English  Second  Obligatory  6    Teaching method  Hydrid  Fernall  SponionCollidant-English  Second  Second    Cororinador  Paris  Fernaldy, Javier  E-mail  gavier, paris 8udc.s    Cororinador  Paris  Fernaldy, Javier  E-mail  gavier, paris 8udc.s    Cororinador  Paris  Fernaldy, Javier  E-mail  gavier, paris 8udc.s    Cororinador  Paris Fernandy, Javier  Lectures  Javier, Javier, Javier  Javier, gavies 8udc.s    Cororinador  Cororinador, Javier  Javier, gavies 8udc.s  Javier, Ja			Teachin	g Guide			
Subject (*)      Concurrency and Parallelism      Code      614G01018        Study programme      Grae an Enxeñaria Informática      Descriptors      U        Cycle      Period      Year      Type      Credits        Graduate      2nd fourmonth period      Second      Obligatory      6        Language      SpainhScalicolEnEnglish           Teaching method      Hybrid       E-mail      javier paris@udc.es        Department      Ciencias da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaría de Computadores          Coordinador      Paris Ferrandez, Javier      E-mail      javier paris@udc.es         Department      Ciencias da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaría de Computadores          Coordinador      Paris Ferrandez, Javier      E-mail      javier paris@udc.es         Desito Inforguez, Jorge      idego darriba @udc.es           Informática      paris ferrandez, Javier      javier paris@udc.es          Orindia Carreira, Juan Jose      javier paris@udc.es <th>Subject (*)      Code      614G01018        Study programme      Gree on Enxohafia Informática      Unescriptors      Ver      Type      Credits        Greaduate      2nd four-month period      Second      Obligatory      6        Greaduate      2nd four-month period      Second      Obligatory      6        Condumper      Spanink-CalicianEnglish      Unescriptors      Ver      Ver      Ver      Ver      Ver      Ver      6      Ver      Ver      6      Ver      Ver      Ver      6      Ver      Ver      6      Ver      Ver      6      Ver      Ver      Ver      Ver      Ver      Ver      6      Ver      Ver</th> <th></th> <th colspan="6">Identifying Data 2020/21</th>	Subject (*)      Code      614G01018        Study programme      Gree on Enxohafia Informática      Unescriptors      Ver      Type      Credits        Greaduate      2nd four-month period      Second      Obligatory      6        Greaduate      2nd four-month period      Second      Obligatory      6        Condumper      Spanink-CalicianEnglish      Unescriptors      Ver      Ver      Ver      Ver      Ver      Ver      6      Ver      Ver      6      Ver      Ver      Ver      6      Ver      Ver      6      Ver      Ver      6      Ver      Ver      Ver      Ver      Ver      Ver      6      Ver		Identifying Data 2020/21					
Descriptors        Descriptors        Cycle      Descriptors        Cycle      Period      Year      Type      Credits        Graduate      2      Credits        Graduate      Credits        Credits      Credits        Credits        Department      Clencias da Computación e Tecnoloxias da Información/ComputaciónEnxeñaría de ComputaciónEnxeñaría de Computación      Carecira Suda Computación e Tecnoloxias da Información/ComputaciónEnxeñaría de ComputaciónEnxeñaría de Computación e Tecnoloxias da Información/ComputaciónEnxeñaría de Computación e Tecnoloxias da Información/ComputaciónEnxeñaría de Computación e Tecnoloxias da Computación Enxeñaría de Computación e Tecnoloxias da María María (Da Computación Enxeñaría de Computación e Tecnoloxias da María (Da Computación Enxeñaría de Computación e Tecnoloxias da María (Da Computación Enxeñaría (Da Computación Enxeñaría (Da Cominguez, Juan Da Come Juna (Da Come Enxeñaría de Computación En	Study programme  Grao en Enxeñaria Informática    Descriptors    Cycle  Period  Vescriptors    Credits    Oradum period  Second  Obligatory  6    Credits    Department  Clencias de Computación e Tecnoloxías da InformaciónComputaciónEnxeñaria de Computaciónes    Coordinador  Paris Fernandez, Javier  E-mail  paire paris@udc.es    Coordinador  Paris Fernandez, Javier  E-mail  paire paris@udc.es    Dopartment  Clencias de Computación e Tecnoloxías da InformaciónComputaciónEnxeñaria du dc.es    Coordinador    Paris Fernandez, Javier  E-mail  paire paris@udc.es    Dariaha Lónga. Dominguez, Jonge  jonatan.ence@udc.es  jonatan.ence@udc.es    Paris Fernandez, Javier  javier.paris@udc.es  juan.guintel.acarroira@udc.es    Quinciela Correira. Juan Jose  juan.guintel.acarroira@udc.es  juan.guintel.acarroira@udc.es    Corntingen pominguez, Juan    Contingence puice Quince.guintel.acarroira@udc.es    Contingence Pairs@udc.es    Quinciela Garcia, Juan Jose    Quinan Lourino@udc.e	Subject (*)	Concurrency and Parallelism Code 614G			614G01018		
Operations      Descriptors        Cycle      Period      Year      Type      Creditis        Graduate      2nd four-month period      Second      Obligatory      6        Language      SpanishGalicianEnglish	Operation      Operation      Type      Credits        Griduate      2nd four-monit period      Second      Obligatory      6        Language      SpanishGalicianEnglish        5        Toaching method      Hybrid       F	Study programme	Grao en Enxeñaría Informática					
Cycle      Period      Year      Type      Credits        Graduate      2nd four-month period      Second      Obligatory      6        Teaching method      Hybrid      Formation of the period      6        Prerequisites      Enclass da Computación e Tecnoloxias da Información/ComputaciónEnxeñaria de Computadores      Coordinador      Paris Fernandez, Javier      E-mail      javier, paris @udc.es        Coordinador      Paris Fernandez, Javier      E-mail      javier, paris @udc.es      jonatan.enes @udc.es        Lecturers      Barreia Rodriguez, Noelia      E-mail      jonatan.enes @udc.es      jonatan.enes @udc.es        Gonzalez, Cominguez, Jonge      jonatan.enes @udc.es      jonatan.enes @udc.es      jonatan.enes @udc.es        Gonzalez, Cominguez, Jorge      jonatan.enes @udc.es      jonatan.enes @udc.es      jorder.gonzilez/@udc.es        Quintela Carreira, Juan Jose      juan.jourine@udc.es      juan.jourine@udc.es      juan.jourine@udc.es        General description      Contingency plan      1. Modifications to the contentis      .        No changes.      2. Methodologies      There will be no change to the teaching methodologies.      .        There will be no changes to the ecaluation      No	Cycla      Period      Year      Type      Credits        Graduate      Zaf four-month period      Second      Obligatory      6        Teaching method      Hybrid      Formation of the period			Descr	riptors			
Graduate  2nd four-month period  Second  Obligatory  6    Language  Spanish-Galical-English	Graduate  2nd four-month period  Second  Obligatory  6    Language  SpanishGalicanEnglish      6    Precenting method  Hybrid          Department  Clencias da Computación a Tecnotoxias da InformaciónComputaciónEnxeñaria de Computadores        Coordinador  Paris Fernandez, Javier  E-mail  javier, paris @udc.es       Lecturers  Barreira Rodriguez, Noelia  E-mail  noelia barreira @udc.es       Deriba López, Diego  Ernsal  noelia barreira @udc.es         González Dominguez, Jorge  jorga gonzález @udc.es  jorga gonzález @udc.es        Quintela Carreira, Juan Jose  juan.quintela carreira@udc.es   juan.quintela carreira@udc.es     General description  1  Modifications to the contents  juan tourino@udc.es      Rendi Lángis, Sudents may contact their teacher through email to ask question about the lectures or the laboratory assignaments.       Web  modifications in the evaluation  .  .  .      No changes.<	Cycle	Period Year Type			Credits		
Language    SpanishGalicianEnglish      Teaching method    Hybrid      Prerequisites    Ciencias da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaría de Computadores      Coordinador    Paris Ferrandez, Javier    E-mail    javier, paris@udc.es      Lecturers    Barreira Rodriguez, Noelia    E-mail    noelia.barreira@udc.es      Darriba López, Diego    diego.darriba@udc.es    jonatan.enes@udc.es      Eres Alvarez, Jonatan    jonatan.enes@udc.es    jonatan.enes@udc.es      Martin Rodilla, Patricia    patricia.martin.rodilla@udc.es    javier, paris@udc.es      Quintela Carreira, Juan Jose    juan, quintela.carreira@udc.es    juan.eurine@udc.es      General description    Touriño Dominguez, Juan    juan.tourino@udc.es      Contingency plan    1. Modifications to the contents    No changes.      2. Methodologies    There will be no change to the teaching methodologies.    .      3. Mechanisms for personalized attention to students    email: daly. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.      4. Modifications in the evaluation.    "Evaluation observations:    No changes.      5. Lectures or the laboratory assignaments.    No changes.    Indeficializes to the evaluation. <th>Language    SpanishGaitcianEnglish      Toeching method    Hybrid      Prerequisites    Department      Ciencias da Computación e Tecnoloxias da InformaciónComputaciónEnxeñaria de Computadores      Coordinador    Paris Fernandez, Javier      E-mail    javier.paris@udc.es      Lecturers    Barrier Rodriguez, Noeia    E-mail      Darriba López, Diego    diego.darriba@udc.es      Darriba López, Diego    geo.darriba@udc.es      Martin Rodlila, Patricia    partis-Gragonzalez/d@udc.es      Quintela Carreira, Juan Jose    juan, jose.annhez, penas@udc.es      Ourineta Carreira, Juan Jose    juan, jose.annhez, penas@udc.es      Touriño Doninguez, Juan    juan.tourino@udc.es      Web    moodle.udc.es    juan.tourino@udc.es      Web    moodle.udc.es    juan.tourino@udc.es      No changes.    2. Methodologies    There will be no change to the teaching methodologies.      There will be no change to the teaching methodologies.    3. Mechanisms for personalized attention to students      email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.    4. Modifications in the evaluation.      Versignation    No changes.    5. Modifications to the</th> <th>Graduate</th> <th>2nd four-month period</th> <th>Sec</th> <th>cond</th> <th>Obligatory</th> <th>6</th>	Language    SpanishGaitcianEnglish      Toeching method    Hybrid      Prerequisites    Department      Ciencias da Computación e Tecnoloxias da InformaciónComputaciónEnxeñaria de Computadores      Coordinador    Paris Fernandez, Javier      E-mail    javier.paris@udc.es      Lecturers    Barrier Rodriguez, Noeia    E-mail      Darriba López, Diego    diego.darriba@udc.es      Darriba López, Diego    geo.darriba@udc.es      Martin Rodlila, Patricia    partis-Gragonzalez/d@udc.es      Quintela Carreira, Juan Jose    juan, jose.annhez, penas@udc.es      Ourineta Carreira, Juan Jose    juan, jose.annhez, penas@udc.es      Touriño Doninguez, Juan    juan.tourino@udc.es      Web    moodle.udc.es    juan.tourino@udc.es      Web    moodle.udc.es    juan.tourino@udc.es      No changes.    2. Methodologies    There will be no change to the teaching methodologies.      There will be no change to the teaching methodologies.    3. Mechanisms for personalized attention to students      email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.    4. Modifications in the evaluation.      Versignation    No changes.    5. Modifications to the	Graduate	2nd four-month period	Sec	cond	Obligatory	6	
Teaching method      Hybrid        Prerequisites      Encides da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaría de Computadores        Coordinador      Paris Fernandez, Javier      E-mail      javier, paris@udc.es        Lecturers      Barreira Rodriguez, Noela      E-mail      poetariba @udc.es        Departineuro      Gencial Aberica @udc.es      idego.darriba @udc.es        Darriba López, Diego      idego.darriba @udc.es      jonata.enes @udc.es        Fraguela Rodriguez, Noela      E-mail      noelia.barreira @udc.es        González Doninguez, Jorge      jorge.gonzalez/@udc.es      jorge.gonzalez/@udc.es        Martin Rodlia, Particia      particia martin.nodlia@udc.es      javier.paris@udc.es        Quintela Carreira, Juan Jose      juan.quintela.carreira@udc.es      juan.quintela.carreira@udc.es        Ouintela Carreira, Juan Jose      juan.tourino@udc.es      general description        Contingency plan      1. Modifications to the contentis      .        No changes.      2. Methodologies      .        There will be no change to the teaching methodologies.      .      .        .      Modifications in the contents      .      .        No changes.      .	Toaching method      Hybrid        Prerequisities      Emerguisation        Department      Ciencias da Computación e Tecnoloxias da Información/ComputaciónEnxeñaría de Computadores        Coordinador      Paris Fernandez, Javier      E-mail      ipvier, paris@udc.es        Lecturers      Barreira Rodriguez, Noelia      E-mail      noelia.barreira@udc.es        Jarriba Lópaz, Diego      diego.darriba@udc.es      diego.darriba@udc.es        Fraguela Rodriguez, Nasia      jorna.enes@udc.es      jorge.gonzalez/dieduc.es        Paris Fernandez, Javier      jorge.gonzalez/dieduc.es      javier.paris@udc.es        Quintela Carreira, Juan Jose      juan.tourino@udc.es      juan.tourino@udc.es        General description      Contingency plan      1. Modifications to the contents        No changes.      2. Methodologies      3. Mechanisms for personalized attention to students        email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.        teams: daily. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.        4. Modifications to the evaluation.      "Evaluation observations:        No changes.      5. Modifications to the bibliography or webgraphy        No changes.	Language	SpanishGalicianEnglish					
Prerequisites      Clencias da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaria de Computadores        Department      Clencias da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaria de Computadores        Coordinador      Paris Fermandez, Javier      E-mail      javier paris@udc.es        Locturors      Barroira Rodríguez, Noelia      E-mail      noelia.barreira@udc.es        Paris Emandez, Jonatan      jordata.ones@udc.es      jorge.gonzalezd@udc.es        Prayele Rodríguez, Basilio Bernardo      goalin.fraguele@udc.es      jorge.gonzalezd@udc.es        González Dominguez, Jorge      jorge.gonzalezd@udc.es      javier.paris@udc.es        Wartin Rodilla, Patricia      paris@udc.es      javier.paris@udc.es        Quintela Carreira; Juan Jose      juan.guintela.carreira@udc.es      juan.guintela.carreira@udc.es        Web      moodle.udc.es      juan.guintela.carreira@udc.es      juan.guintela.carreira@udc.es        Contingency plan      1. Modifications to the contents      juan.bore.      2.        No changes.      2.      Methodologies      There will be no change to the teaching methodologies.        There will be no change to the teaching methodologies.      3.      Mechanisms for personalized attention to students        email: daily. Students may ask	Prereguistes      Clencias da Computación e Tecnoloxías da InformaciónComputaciónEnxeñaría de Computadores        Coordinador      Pairs Fernandez, Javier      E-mail      javier.pairs@udc.es        Lecturers      Barreira Rodriguez, Joeia      E-mail      jordenador        Lecturers      Barreira Rodriguez, Noelia      E-mail      indeputationEnxeñaría de ComputaciónEnxeñaría de Computatores        Lecturers      Barreira Rodriguez, Joeia      E-mail      indeputatores      ideputatores        González Dominguez, Jorge      jorde.ante® dudc.es      jorde.es      jorde.es        Martin Rodilla, Patricia      patricia martin.rodilla@udc.es      juan.guintela.carreira@udc.es        Quintela Carreira, Juan Jose      juan.guintela.carreira@udc.es      juan.guintela.carreira@udc.es        Web      moodle.udc.es      iuan.guintela.carreira@udc.es      juan.guintela.carreira@udc.es        Veb      moodle.udc.es      2.      Methodologies      .        There will be no change to the teaching methodologies.      .      3.      Mechanisms for personalized attention to students        email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.      4.        i. Modifications in the evaluation.      "E	Teaching method	Hybrid					
Department      Clencias da Computación e Tecnoloxías da InformaciónComputaciónEoxeñaria de Computadores        Coordinador      Paris Fernandez, Javier      E-mail      javier paris @udc.es        Lecturers      Barreira Rodriguez, Noelia      E-mail      noelia barreira @udc.es        Darriba López, Diego      ionelia barreira @udc.es      ionelia barreira @udc.es        Fraguela Rodriguez, Noelia      E-mail      noelia barreira @udc.es        González Dominguez, Jorge      jorge.gonzalez@l@udc.es      jorate.cs        Paris Fernandez, Javier      javier.paris @udc.es      javier.paris @udc.es        Quincia Carreira, Juan Jose      juan.quintela.arreira @udc.es      javier.paris @udc.es        Quincia Carreira, Juan Jose      juan.guintela.arreira @udc.es      juan.guintela.arreira @udc.es        General description      Contingency plan      1. Modifications to the contents      No changes.        2. Methodologies      There will be no change to the teaching methodologies.      3. Mechanisms for personalized attention to students        email: daily. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.      4. Modifications in the evaluation.        "Evaluation observations:      No changes.      1. Modifications in the evaluation.	Department      Clenclas da Computación e Tecnoloxías da Información/ComputacionEnxeñarla de Computadores        Coordinador      Paris Fernandez, Javier      E-mail      Javier.paris 2004.ces        Lecturers      Barreira Rodriguez, Noella      E-mail      noella barreira 8/udc.es        Darriba López, Diego      Incelia de Computación e Securita 2004.ces      Darriba López, Diego      postan.enes®udc.es        Enes Álvarez, Jonatan      jonatan.enes®udc.es      Darriba 2004.ces      Darriba 2004.ces        Genzález Domínguez, Jorgo      paris 2004.ces      paris 2004.ces      Darriba 2004.ces        Mertin Rodilla, Patricia      paris 2004.ces      paris 2004.ces      Darriba 2004.ces        Quintela Carreira, Juan Jose      juan.quintela.carreira 2004.ces      juan.gens.anchez Penas.2004.ces        General description      Touriño Doninguez, Juan      juan.tourino 2004.ces        Contingency plan      1. Modifications to the contents      .        No changes.      2. Methodologies      .        There will be no change to the teaching methodologies.      .      .        3. Mechanisms for personalized attention to students      .      email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.	Prerequisites						
Coordinador      Paris Fernandez, Javier      E-mail      javier paris @udc.es        Lecturers      Barreira Rodriguez, Noelia      E-mail      noelis.barreis @udc.es        Darriba López, Diego      diego.darriba@udc.es      diego.darriba@udc.es        Fraguela Rodriguez, Basilio Bernardo      basilio.fraguela@udc.es      porge.gonzale2 @udc.es        González, Dominguez, Jorge      porge.gonzale2 @udc.es      porge.gonzale2 @udc.es        Martin Rodilla, Patricia      paris Fernandez, Javier      javier.paris@udc.es        Quintela Careira, Juan Jose      javier, paris@udc.es      javier.paris@udc.es        Web      moodle.udc.es      juan.gose.sanchez.penas@udc.es        Web      moodle.udc.es      juan.jose.sanchez.penas@udc.es        Contingency plan      1. Modifications to the contents      No changes.        2. Methodologies      There will be no change to the teaching methodologies.      3. Mechanisms for personalized attention to students        email: daily. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.      4. Modifications in the evaluation.        Verbustion observations:      No changes.      1. Modifications in the evaluation.	Coordinador      Paris Fernandaz, Javier      E-nail      javier.paris@udc.es        Lecturers      Barreira Rodriguez, Noelia      E-nail      noelia.barria@udc.es        Darriba López, Diego      diego.darriba@udc.es      diego.darriba@udc.es        Ernes Ávaraz, Jonatan      paristal.ones@udc.es      jorge.onzalez@udc.es        Martin Rodilla, Patricia      particia.martin.rodilla@udc.es      jorge.onzalez@udc.es        Paris Fernandez, Javier      juan.quintela.carreira@udc.es      juan.quintela.carreira@udc.es        Quintela Carreira, Juan Jose      juan.quintela.carreira@udc.es      juan.gos.anchez.ponas@udc.es        Web      moodle.udc.es      juan.tourino@udc.es      juan.tourino@udc.es        General description      -      -      -        Contingency plan      1. Modifications to the contents      -      -        No changes.      2. Methodologies      -      -        There will be no change to the teaching methodologies.      -      -        There will be no change to the evaluation to students      -      -      -        email: daily. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.      -        4. Modifications in the	Department	Ciencias da Computación e Teci	noloxías da Info	rmaciónComput	aciónEnxeñaría de Compu	utadores	
Lecturers    Barreira Rodriguez, Noelia    E-mail    noelia.barreira @udc.es      Darriba López, Diego    diego.darriba @udc.es    diego.darriba @udc.es      Fraquela Rodriguez, Basilo Bernardo    basilo.fraquela @udc.es    joratan-ene@udc.es      González Dominguez, Jorge    jorge.gonzalezd@udc.es    patricia.mantin.rodila@udc.es      Paris Fernandez, Javier    javier, paris@udc.es    juan.quintela.carreira@udc.es      Quintela Carreira, Juan Jose    juan.quintela.carreira@udc.es    juan.gose.sanchez.penas@udc.es      Tourño Dominguez, Juan    moodle.udc.es    juan.tourino@udc.es      General description    Contingency plan    1. Modifications to the contents      No changes.    2. Methodologies    There will be no change to the teaching methodologies.      3. Mechanisms for personalized attention to students    email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.      4. Modifications in the evaluation.    "Evaluation observations:"    No changes.      7. Mudifications in the evaluation.    "Evaluation observations:"    No changes.	Lecturers  Barreira Rodriguez, Noelia  E-mail  noelia barreira @udc.es    Darriba López, Diego  idego.darriba %edu.es  jonatan.enes@udc.es    Fraguela@udc.es  jonatan.enes@udc.es  jorge.gonzalezd@udc.es    Paris Fraguela@udc.es  jorge.gonzalezd@udc.es  jorge.gonzalezd@udc.es    Paris Fraguela@udc.es  jorge.gonzalezd@udc.es  jorge.gonzalezd@udc.es    Paris Fraguela@udc.es  jorge.gonzalezd@udc.es  jorge.gonzalezd@udc.es    Quintela Carreira.juan Jose  juan.quintela.carreira@udc.es  juan.quintela.carreira@udc.es    Yeb  moodle.udc.es  juan.quintela.carreira@udc.es  juan.gonze.schee.ens.g@udc.es    Yeb  moodle.udc.es  juan.gonze.schee.ens.g@udc.es  juan.gonze.schee.ens.g@udc.es    Contingency plan  1. Modfications to the contents  juan.courino@udc.es    No changes.  2. Methodologies  There will be no change to the teaching methodologies.    3. Mechanisms for personalized attention to students  amail: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.    teams: daily. Students may ask for a meeting on teams to ask questions about the lectures or the laboratory assignaments.    4. Modfications in the evaluation.    "Evaluation observations:    No changes.    5. Modfications to the bibliography or webgraphy    <	Coordinador	Paris Fernandez, Javier		E-mail	javier.paris@udc	.es	
Darriba López, Diego    diego.darriba@udc.es      Enes Alvarez, Jonatan    jonatan.enes@udc.es      Fraguela Rodriguez, Basilio Bernardo    basil.orguela@udc.es      González Dominguez, Jorge    jorge.gonzalezd@udc.es      Martin Rodlla, Patricia    patrica.martin.codll@udc.es      Paris Fernandez, Javier    javier.paris@udc.es      Quintela Carreira, Juan Jose    juan quintela.carreira@udc.es      Sanchez Penas, Juan Jose    juan quintela.carreira@udc.es      Touño Dominguez, Juan    juan.jose.sanchez.penas@udc.es      Touño Dominguez, Juan    juan.tourino@udc.es      Web    moodle.udc.es      General description	Darriba López, Joigo    diego.darriba @udc.es      Enes Álvarez, Jonatan    jonatan.enes @udc.es      Fraguela Rodriguez, Basilio Bernardo    jorge.gonzalez/@udc.es      González Dominguez, Jorge    jorge.gonzalez/@udc.es      Martín Rodilla, Patricia    patricia.martín.rodilla @udc.es      Paris Fernandez, Javier    juan.gonzalez/@udc.es      Quintela Carreira, Juan Jose    juan.gonzalez/@udc.es      Sanchez Penas, Juan Jose    juan.gonzalez/@udc.es      Touriño Dominguez, Juan    juan.gonz.ancreira@udc.es      General description    moodle.udc.es      Contingency plan    1. Modifications to the contents      No changes.    2. Methodologies      There will be no change to the teaching methodologies.    3. Mechanisms for personalized attention to students      email: daily. Students may contact their teacher through email to ask question about the lectures or the laboratory assignaments.      i teams: daily. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.      i teams: daily. Students may ask for a meeting on teams to ask question shout the lectures or the laboratory assignaments.      i teams: daily. Students may ask for a meeting on teams to ask question about the lectures or the laboratory assignaments.      i teams: daily. Students may ask for a meeting on teams to ask question	Lecturers	Barreira Rodriguez, Noelia		E-mail	noelia.barreira@u	udc.es	
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	Study programme competences / results
Code	Study programme competences / results



A12	Coñecemento e aplicación dos procedementos algorítmicos básicos das tecnoloxías informáticas para deseñar solucións a problemas,
	analizando a idoneidade e a complexidade dos algoritmos propostos.
A20	Coñecemento e aplicación dos principios fundamentais e técnicas básicas da programación paralela, concorrente, distribuída e de tempo
	real.
B3	Capacidade de análise e síntese
C4	Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a
	realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C8	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da
	sociedade.

Learning outcomes			
Learning outcomes	Study programme		amme
	con	competences /	
		results	
The student should know basic algorithms and how to apply them to solve problems, analyzing the adequacy and complexity		B3	C4
of the proposed concurrent and parallel algorithms.			
The student should know how to apply the fundamentals of real time, parallel, concurrent and distributed programming.			C6
			C8

Contents		
Торіс	Sub-topic	
T1. Concurrent programming fundamentals	1.1 Concepts	
	1.1.1 Hardware architectures	
	1.1.2 Operating Systems	
	1,1.3 Threads and Processes	
	1.2 Multiprocess programming (fork/join)	
	1.3 Multithread programming	
	1.4 Critical section	
	1.5 Mutual exclusion	
1.6 Atomic instructions		
	1.7 Condition synchronization	
	1.8 Semaphores	
	1.8.1 Mutex	
	1.8.2 Semaphores	
	1.9 Deadlock. Prevention, avoidance, recovery	
	1.10 Starvation	
	1.11 Communication and synchronization	
	1.12 Scalability	
T2. Concurrent Algorithms	2.1 Producers/consumers.	
	2.2 Readers/writers	
	2.3 Dining philosophers	
	2.4 Shared nothing	



.1 Concepts
1.1 Levels of paralellism
1.2 Data dependencies
.2 Message passing model
2.1 Basic concepts
2.2.2 Point to point communication
2.3 Collective operations
3.3 Analysis of parallel algorithms
3.3.1 Performance measure of parallel algorithms
.4 Methodology for parallel programming
2.4.1 Task decomposition
.4.2 Task assignment
.4.3 Optimization techniques
5.5 Schemes for parallel algorithms
5.1 Single Process Multiple Data
.5.2 Master/slave paradigm
.1 Message passing libraries
.2 Case of study
.3 Performance evaluation
.4 Inclusion of optimization techniques
5. 5. 5. 5. 5. 5.

Planning				
Methodologies / tests	Competencies /	Teaching hours	Student?s personal	Total hours
	Results	(in-person & virtual)	work hours	
Guest lecture / keynote speech	A12 A20 C4 C6 C8	30	45	75
Mixed objective/subjective test	A12 A20 B3 C4 C6	3	0	3
Laboratory practice	A12 A20 B3 C8	16	24	40
Problem solving	B3 C6	10	19	29
Practical test:	A20 A12 B3	2	0	2
Personalized attention		1	0	1

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

	Methodologies
Methodologies	Description
Guest lecture /	Lecture with audiovisual reinforcement materials, and questions directed at the students to reinforce the transmission of
keynote speech	concepts and improve the learning process.
Mixed	Written exam with questions about the content of the lectures and the practical problems solved in the laboratory practice.
objective/subjective	
test	
Laboratory practice	Practical activities aimed at enhancing the comprehension of the material by the students, such as programming exercicies.
Problem solving	Solving of concrete problems that appeared during the laboratory practice, possibly exploring multiple solutions.
Practical test:	Tests about the contents of the laboratory practices. Part of the ongoing evaluation.

	Personalized attention
Methodologies	Description



Laboratory practice	During the laboratoy practice, seminars and problem solving sessions students will be able to ask questions about the
Problem solving	contents. The teacher, after considering these questions, will reinforce specific topics, solve problems that involve the
	concepts that are unclear, or any other activity that may help to improve the understanding of the content.
	All tutoring sessions will be held online.

		Assessment	
Methodologies	Competencies /	Description	Qualification
	Results		
Practical test:	A20 A12 B3	Ongoing assesment exams on the contents of the lectures and the laboratory	20
		practices.	
Laboratory practice	A12 A20 B3 C8	Practical exercises divided on two blocks: concurrency and parallelism. Each block is	30
		worth 50% of the laboratory practice grade. Exercises can be solved in groups of two,	
		but will be graded individually.	
Mixed	A12 A20 B3 C4 C6	Exam on the contents explained during the lectures and practiced in the laboratory.	50
objective/subjective		There will be two parts: concurrency (topics T1 and T2) and parallelism (topics T3 and	
test		T4). Each part is worth 50% of the grade of the mixed test.	

Assessment comments

The final grade will be the weighted addition of the mixed test, the laboratory practice grades, and the practical test grades. In order to pass it is necessary to get at least 50% of the maximum grade.

For the July evaluation only the mixed test will be graded again (70% of the total grade).

The grade obtained during the term in the laboratory practice (30% of the final grade) and the practicas tests (20% of the final grade) will be used for both the June and July evaluations. The grade for the laboratory practices will not be reassessed during the second opportunity. The evaluation of the laboratory practices must be done in the group assigned to each student.

No special consideration will be given to students with part time enrollment.

	Sources of information
Basic	- Doug Lea (2000). Concurrent programming in Java design, principles and patterns . Reading, Massachusetts:
	Addison Wesley
	- Joe Armstrong (2007). Programming Erlang: Software for a Concurrent World. United States: Pragmatic
	Programmers
	- Francisco Almeida [et al.] (2008). Introducción a la Programación Paralela. Madrid: Paraninfo Cengage Learning
	- Peter S. Pacheco (1997). Parallel Programming with MPI. San Francisco, California : Morgan Kauffman
Complementary	- Wilkinson, B. y Allen, M (1999). Parallel Programming. Techniques and Applications Using Networked Workstations
	and Parallel Computers Upper Saddle River, New Jersey : Prentice Hall,

Recommendations	
Subjects that it is recommended to have taken before	
Programming II/614G01006	
Algorithms/614G01011	
Computer Structure/614G01012	
Programming Paradigms/614G01014	
Software Design/614G01015	
Subjects that are recommended to be taken simultaneously	
Operating Systems/614G01016	
Networks/614G01017	
Software Process/614G01019	



Subjects that continue the syllabus

Internet and Distributed Systems/614G01023

**Other comments** 

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.